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ABSTRACT

This workbook is part six of a self-instructional course prepared for the United States Environmental Protection Agency. The student proceeds at his own pace and when questions are asked, after answering, he either turns to the next page to check his response or refers to the previously covered material. The purpose of this course is to prepare the student for the APC Training Certificate. This section covers tasks that should be done daily to keep the incinerator system running smoothly and maintenance tasks to be performed periodically. Troubleshooting checks are also included. (BT)

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Air Pollution Training Institute Self-Instructional Course SI-466

Part 6
The Incinerator: Section Two Maintenance and Troubleshooting

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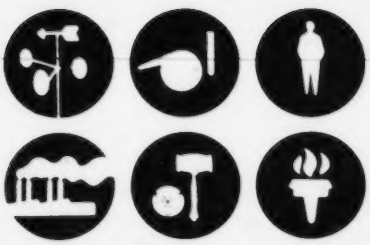

United States
Environmental Protection Agency
Office of Air and Water Programs

Training Manual
Self-Instructional Course SI-466

Air Pollution Training Institute

United States
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Part Six
The Incinerator:
Section Two
Maintenance and Troubleshooting

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Control Programs Development Division
Air Pollution Training Institute

US EPA

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6

THIS IS PART 6
THE INCINERATOR: SECTION TWO
MAINTENANCE AND TROUBLESHOOTING

Additional units of this self-instructional course are:

PART ONE
The Basics of Preventing Air
Pollution Emissions from Boilers

PART TWO
The Basics of Boiler Operation
and Maintenance

PART THREE
Troubleshooting, Section One
Boilers: Correcting Oil Temperature

PART FOUR
Troubleshooting, Section Two
Boilers: Flame Reading

PART FIVE
The Incinerator: Section One
Basic Parts and Fundamentals

SUPPLEMENT A:
Operator's Manual, Boiler Room
Operations and Maintenance

INTRODUCTION

In the first incinerator section you saw the basic incinerator parts and how they operate.

This section will cover tasks you should do each day to keep the system running smoothly and maintenance tasks to be performed periodically. Also included are troubleshooting checks to make before calling service should you get smoke.

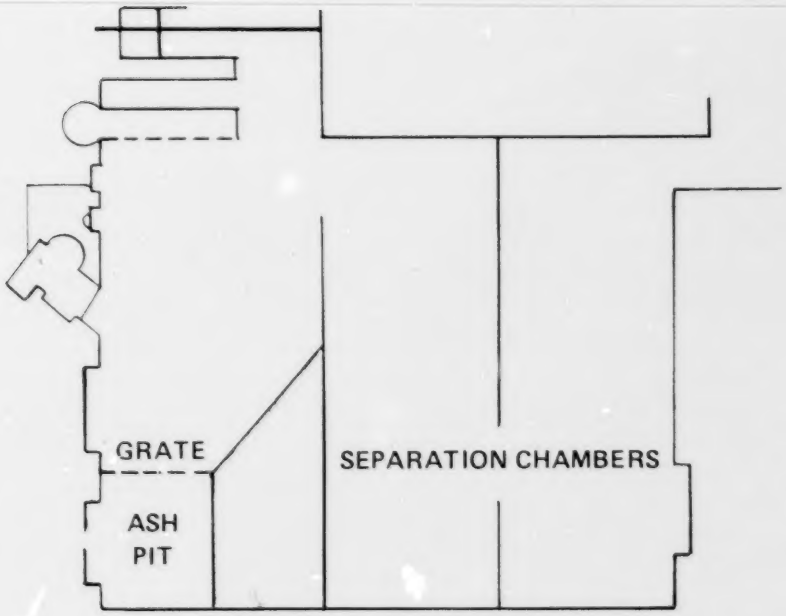
First - daily cleaning tasks.

DAILY CLEANING

Daily Cleaning reduces your chances of producing smoke. Your system will not work smoothly if clogged with waste from burning.

Set a time each day to clean and check the incinerator. WAIT AT LEAST ONE HOUR after a burn for the furnace to cool. SHUT DOWN THE SYSTEM by pushing the stop button.

BELOW ARE THREE PLACES to clean.



1. How long should you wait after a burn to clean the incinerator? _____

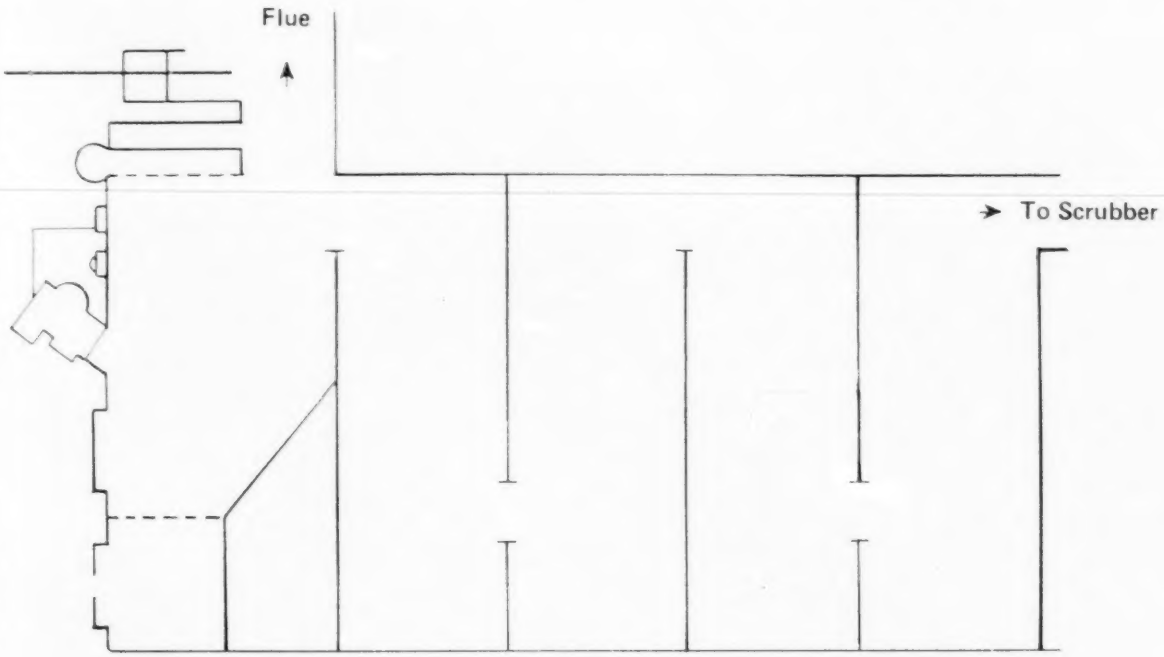
2. From where would you clean cans, bottles and other large waste material? _____

3. From where would you clean most of the ash? _____

– Check your answers.

1. 1 hour or more
2. Grate
3. Ash Pit

On this diagram, MARK AN "X" on the number of SEPARATION CHAMBERS that you have on your system. Leave this blank if you have none.



You may also have a roof settling chamber. Some systems have the scrubber and chambers on the roof.

Name the three places covered so far to be cleaned each day.

_____

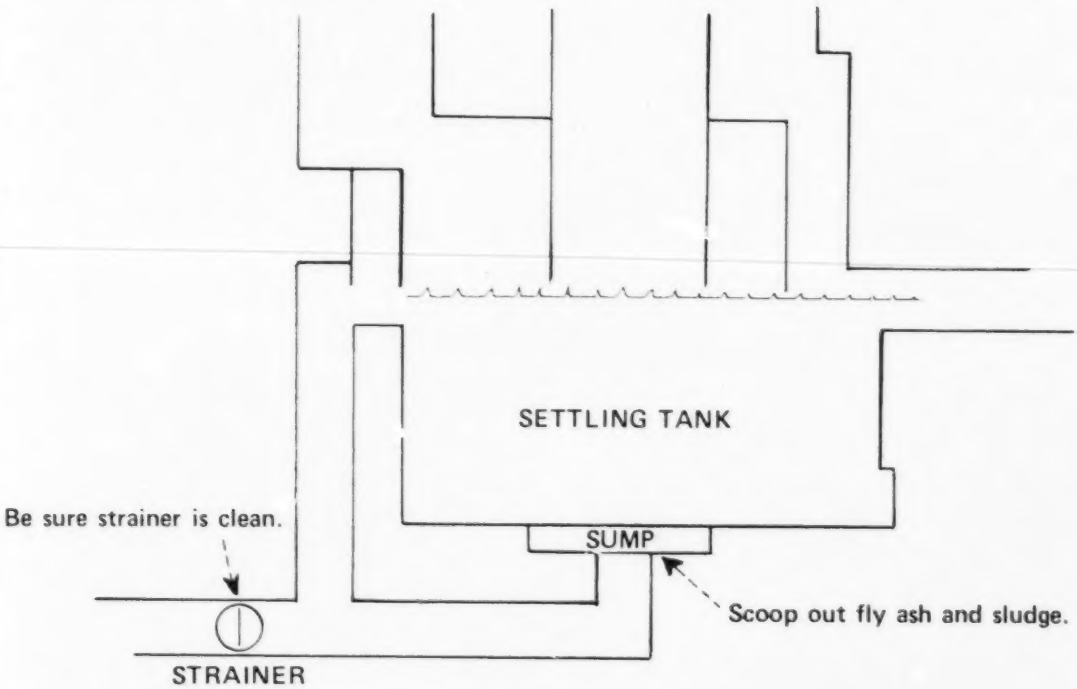
_____

_____

– Check your answers.

Grate
Ash Pit
Separation Chambers

DAILY SCRUBBER CLEANING



1. Where will most of the fly ash in the settling tank collect? _____

2. What must be cleaned to prevent the discharge water line from clogging? _____

After cleaning, be sure all incinerator doors are closed and turn the system back to automatic.

– Check your answers.

1. sump
2. strainer

DAILY CLEANING REVIEW

ANSWER THESE QUESTIONS:

1. Name three places in the incinerator (other than the scrubber) to clean each day. _____ _____ _____

2. Name two places in the scrubber to clean daily. _____ _____

3. How long should you wait after a burn to clean your system? _____

CIRCLE THE CORRECT WORDS below:

4. Turn your system ON/OFF before cleaning.

5. After cleaning be sure to OPEN/CLOSE all incinerator doors.

– Check your answers.

ANSWERS TO PREVIOUS PAGE:

1. Grate
   Ash Pit
   Separation Chambers

2. Sump
   Strainer

3. 1 hour

4. OFF

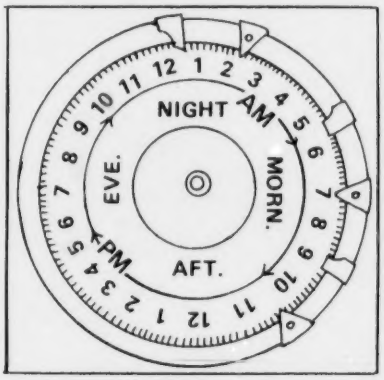
5. CLOSE

DAILY CHECKS

In addition to cleaning, there are some DAILY CHECKS to make to keep major parts in good working order.

CYCLING TIME CLOCK

ON THIS CLOCK, CIRCLE THE TIMES YOUR CLOCK IS SET to start a burn:



The clock is important as it brings together burning ingredients - garbage, air, ignition. If your clock isn't working, call service to fix it.

Whom do you call for incinerator service? _____

Do you have his number at a convenient place for easy access? _____

Incinerator service agencies usually repair all equipment.

What is the first daily check to make? _____

– Check your answer.

FUEL GATE

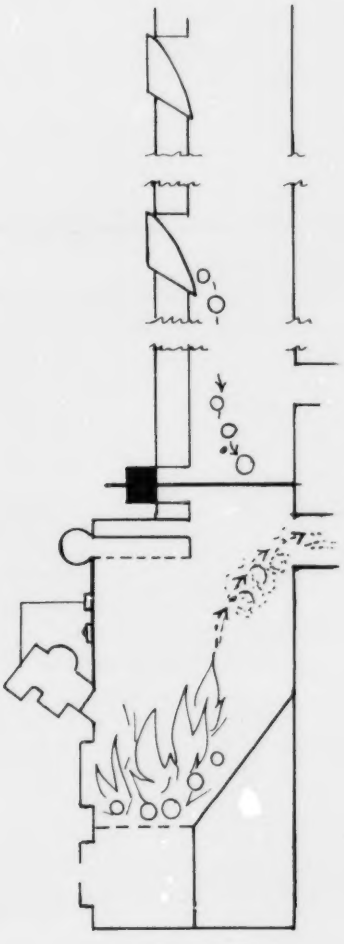
Next, check the CHARGING FLUE GATE.

Assume the follow.ng for the cases below:

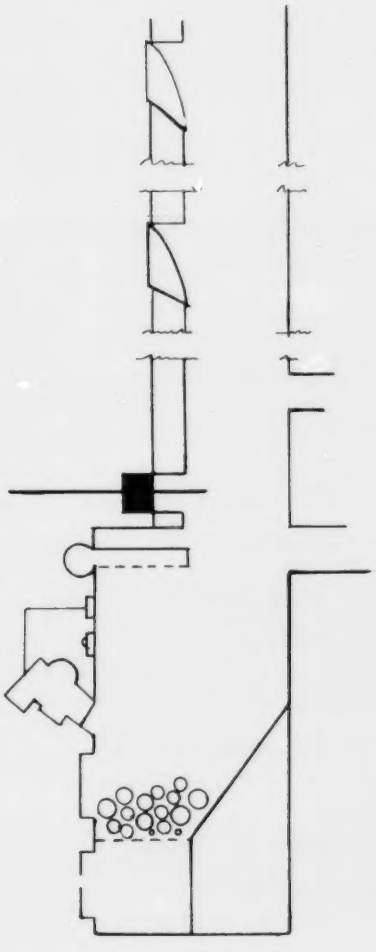
Time clock is set at 10:00 A.M. and is working.

Time is now 10:30 A.M.

CIRCLE THE CORRECT WORDS under each:



1.
Charging gate apparently
JAMMED/WORKING



2.
Charging Gate apparently
JAMMED/WORKING

The first incinerator has started to burn and is OK. The second is jammed in the open position. It could also jam closed or partially open.

If the charging gate becomes jammed, check to see if GARBAGE is BLOCKING the gate or track. If not, the ACTUATOR PISTON may not be working. It is usually operated by water pressure. If your basic utilities (electric supply, city water pressure) are OK, call service.

1. What two things should you check if your charging gate becomes jammed?

   _____

   _____

2. Name two daily equipment checks to make.

   _____

   _____

– Check your answers.

1. Garbage blocking gate
   Actuator Piston working
2. Cycling Time Clock
   Charging Flue Gate

LAST TWO DAILY CHECKS:

BLOWER MOTOR – OVERFIRE AIR	Sound normal?
GAS BURNER	Sound normal? Spark Plugs connected? Gas cock open?

You will normally not have problems with the above, but they are important. Be sure they are in good working order.

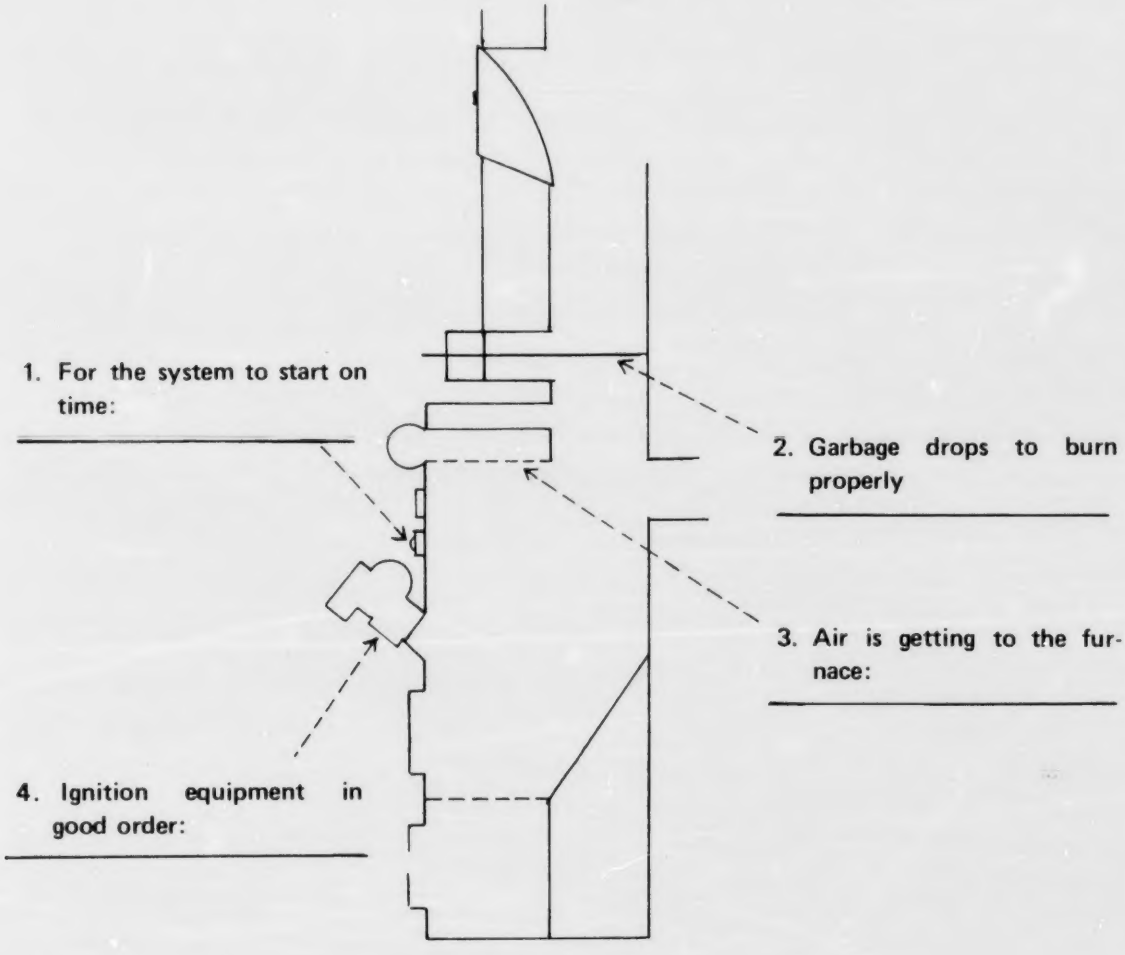
1. What air source has movable parts and should be checked daily? _____

2. What part is checked to confirm dependable ignition? _____

– Check your answers.

1. Blower - Overfire Air
2. Gas Burner

COMPLETE DAILY INCINERATOR CHECKS BELOW:



1. For the system to start on time:

2. Garbage drops to burn properly

3. Air is getting to the furnace:

4. Ignition equipment in good order:

NOW – two daily scrubber checks.

– Check your answers.

1. Cycling Time Clock
2. Charging Flue Gate
3. Overfire Air Blower
4. Gas Burner

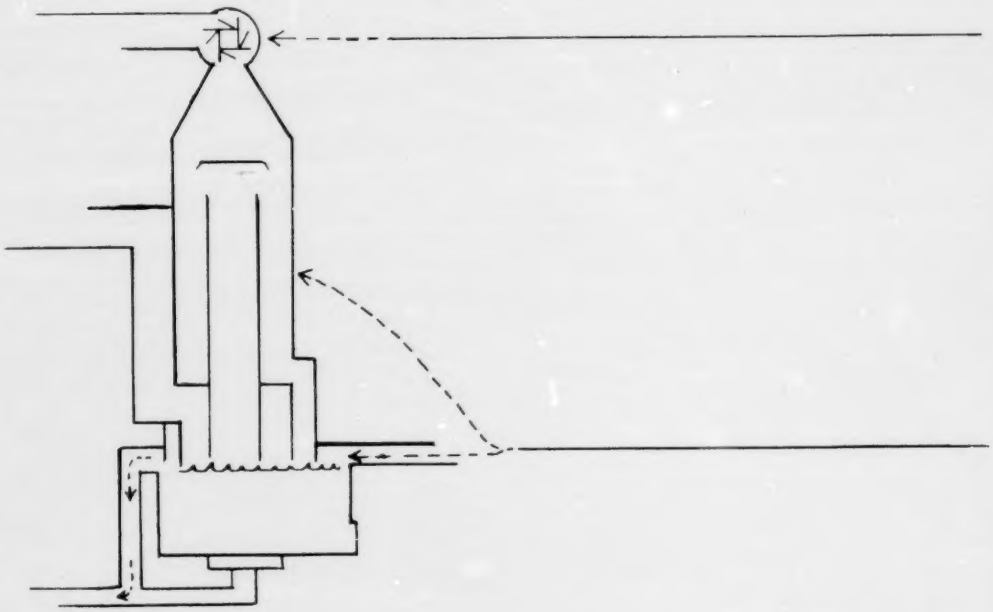
SCRUBBER - DAILY CHECKS

TWO SCRUBBER CHECKS:

1. WATER CIRCULATION - water moving vigorously; in and out at proper rate.

2. FAN AND MOTOR WORKING - gases taken from the scrubber and out the flue.

On the diagram WRITE THESE TWO on the appropriate lines.



Water must circulate to clean the gases. The fan (at the top) pulls off gases for discharge. You may have a WATER LEVEL GAUGE to monitor scrubber water.

1. Is there a water level gauge on your system? _____

2. How does your scrubber circulate the water (pump, draft pressure, other)? _____

3. What equipment pushes Scrubber gases out the flue which should be checked daily? _____

– Check your answers.

1. check your own answer
2. check your own answer
3. Fan (and motor)

REVIEW - DAILY CHECKS

COMPLETE THE DAILY INCINERATOR CHECKS.

1. Cycling _____ _____
2. Charging _____ _____
3. Overfire Air – _____
4. Gas _____

5. Scrubber – _____ Circulation
6. Scrubber – _____ and Motor.

If you find any sign of trouble which you cannot easily fix, call service before it develops into a major problem.

– Check your answers.

1. Cycling Time Clock
2. Charging Flue Gate
3. Overfire Air - Blower
4. Gas Burner
5. Scrubber - Water Circulation
6. Scrubber - Fan and Motor

This completes the DAILY CLEANING and CHECKING TASKS; they are summarized below.

DAILY CLEANING

1. Grate
2. Ash Pit
3. Separation Chambers
4. Scrubber Sump
5. Scrubber Water Line Strainer

DAILY CHECKS

1. Cycling Time Clock
2. Charging Flue Gate
3. Overfire Air - Blower
4. Gas Burner
5. Scrubber - Water Circulation
6. Scrubber - Fan and Motor

THESE ARE INCLUDED IN YOUR INCINERATOR HANDBOOK, PAGE 9 FOR YOUR FUTURE REFERENCE.

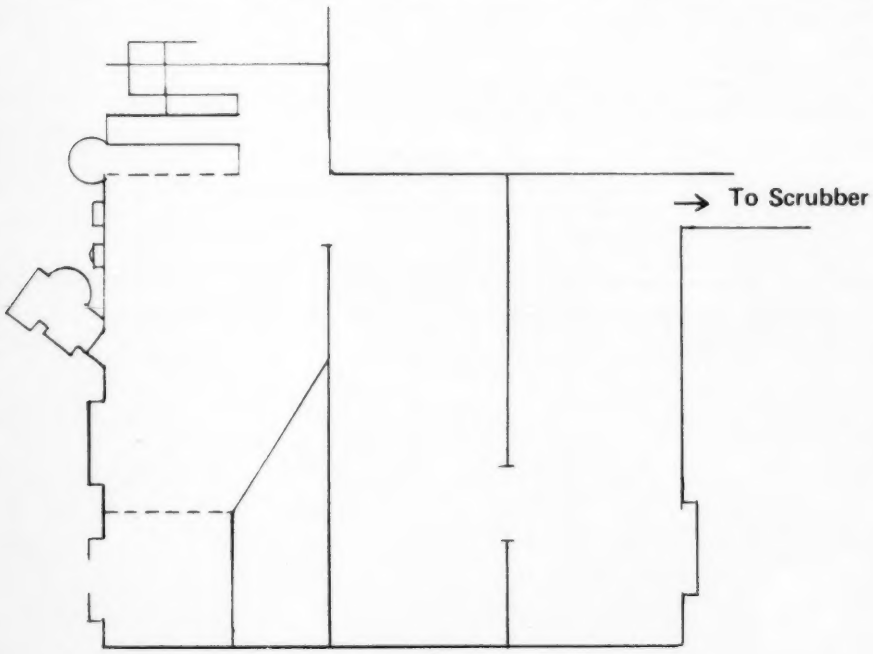
PERIODIC MAINTENANCE

There are three cleaning tasks to be done periodically apart from the scrubber. These are: 1) ASH BUILD-UP, 2) CHARGING FLUE PURGE, and 3) SPARK ARRESTOR.

ASH BUILD UP

Even though you regularly clean ash from the floors of your system, there will be build-up on the CHAMBER WALLS and LEDGES.

DRAW LINES ALONG SURFACES on the diagram which you should clean periodically.



You should have indicated ALL INSIDE BURNING AND SEPARATION CHAMBER WALLS AND LEDGES. You normally reach these through access doors.

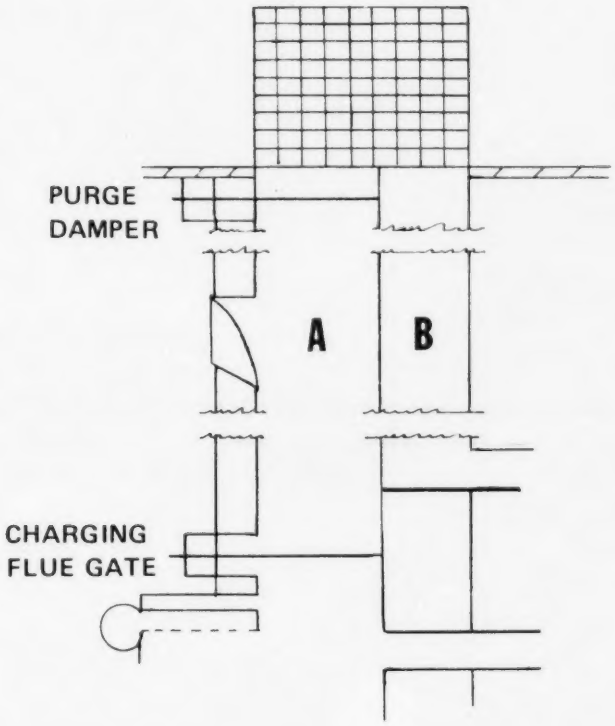
How many chambers do you have to periodically clean for ash build-up? _____

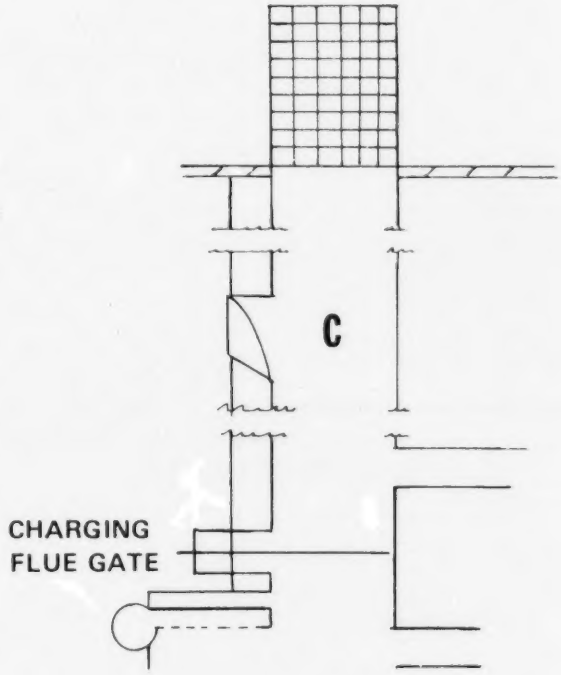
DOUBLE FLUE – PURGE CHARGING FLUE

This task is done only in the case of a double flue incinerator.

As garbage goes down the Charging Flue, a certain amount of GREASE collects on the WALLS and attracts INSECTS.

Look at these flue. ANSWER THE QUESTIONS BELOW:





Which of the flues above has garbage going down and gases going up? _____

Which flue walls would collect garbage and insects which would not be burned off with each burn? _____

Flue C has garbage and gases passing through and is cleaned with each burn. Flue A must be cleaned by purging.

Here's how to purge the charging flue:

1. PUT SYSTEM ON MANUAL CONTROL
2. TURN SCRUBBER OFF
3. OPEN BY-PASS DAMPER
4. OPEN PURGE DAMPER
5. OPEN CHARGING GATE
6. TURN GAS BURNER ON

In the list above, CIRCLE THE TWO DAMPERS to be opened for purging.

If the charging gate is not open, the hot gases cannot enter the flue. You should have circled by-pass and purge in the above list.

1. What provides heat (hot gases) for purging? _____

2. What are the two maintenance tasks seen so far to be performed periodically? _____

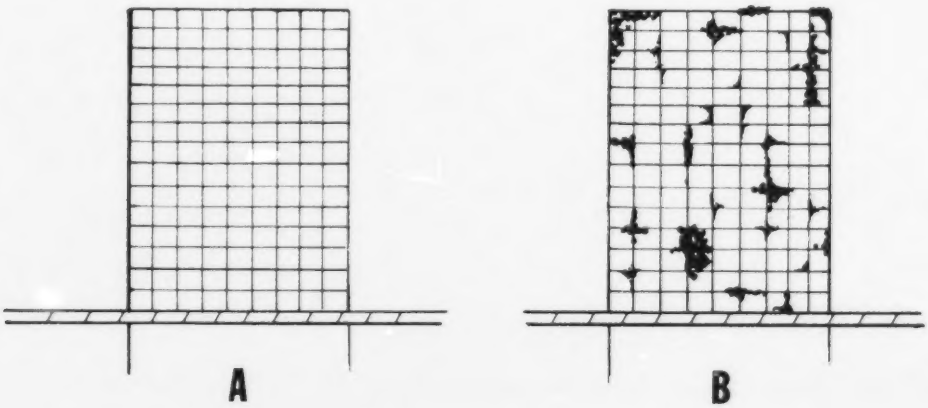
_____

— Check your answers

1. Gas Burner
2. Clean ash build-up
   Purge charging flue

CLEAN SPARK ARRESTOR

Here are two spark arrestors. ANSWER THE QUESTIONS under them.



Does A or B show a spark arrestor that may interfere with flue gases? _____

Does A or B show a spark arrestor that is in good condition? _____

The second spark arrestor above needs to be cleaned with a wire brush. The build-up may interfere with some flue gases.

Name three maintenance tasks to be performed periodically in your incinerator.

_____

_____

_____

– Check your answers.

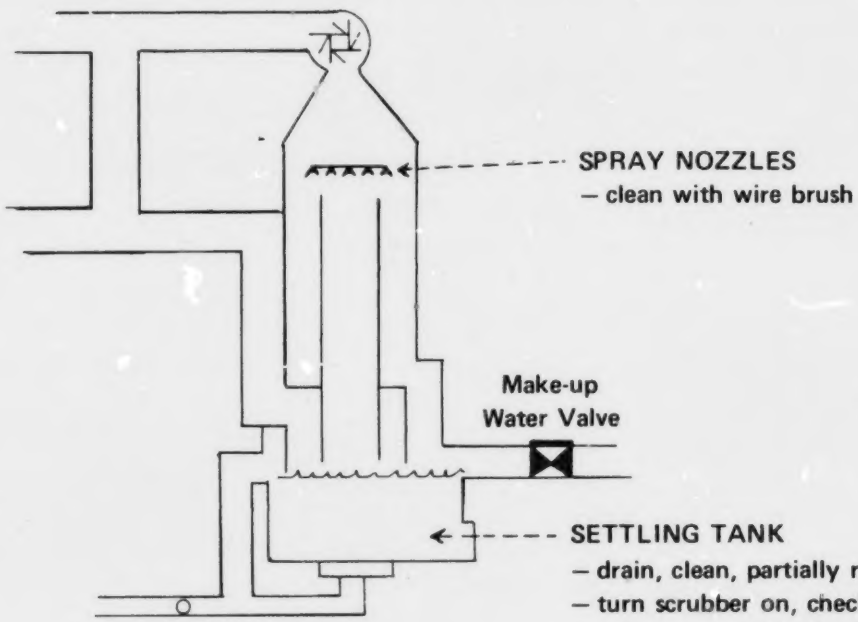
Clean ash build-up
Purge charging flue
Clean spark arrestor

SCRUBBER MAINTENANCE

All Scrubbers are different. There are three tasks you should perform periodically on yours no matter what the type.

Before cleaning - TURN SCRUBBER OFF.

TWO PERIODIC CLEANING TASKS are on this diagram



1. What do you clean to be sure you have a good water curtain? _____

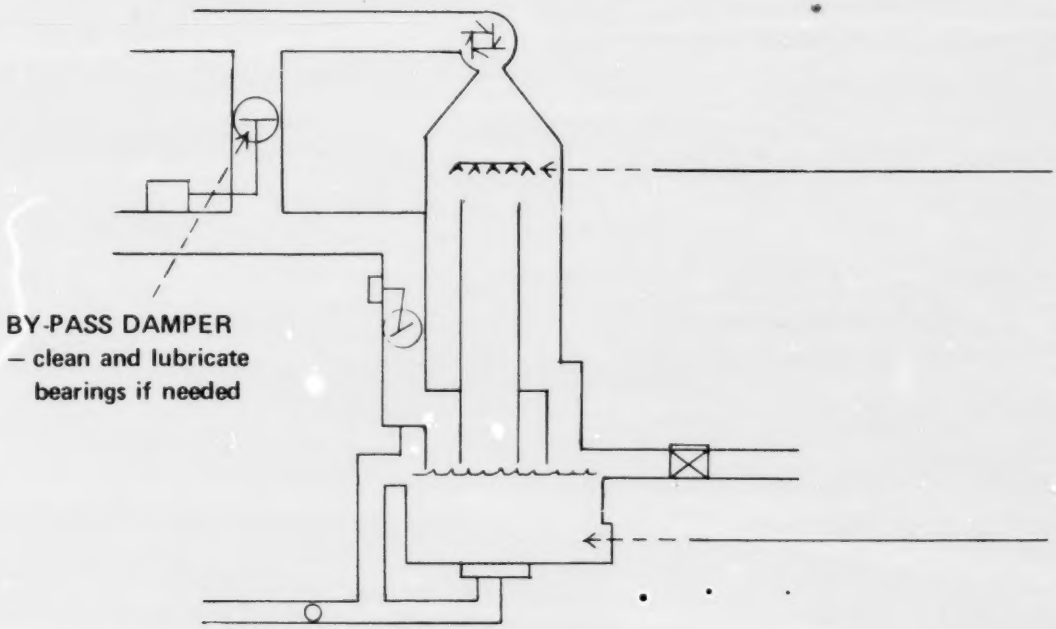
2. What ash-collecting area should be cleaned periodically in the scrubber? _____

3. What valve should be checked for adequate water control? _____

– Check your answers.

1. Spray nozzles
2. Settling tank
3. Make-up water valve

On the diagram, LABEL TWO SCRUBBER MAINTENANCE TASKS just considered.



CHECK AND CORRECT YOUR DIAGRAM using the diagram on the previous page.

The THIRD SCRUBBER MAINTENANCE TASK is shown on the diagram above.

1. What damper should be periodically checked for good operation? _____

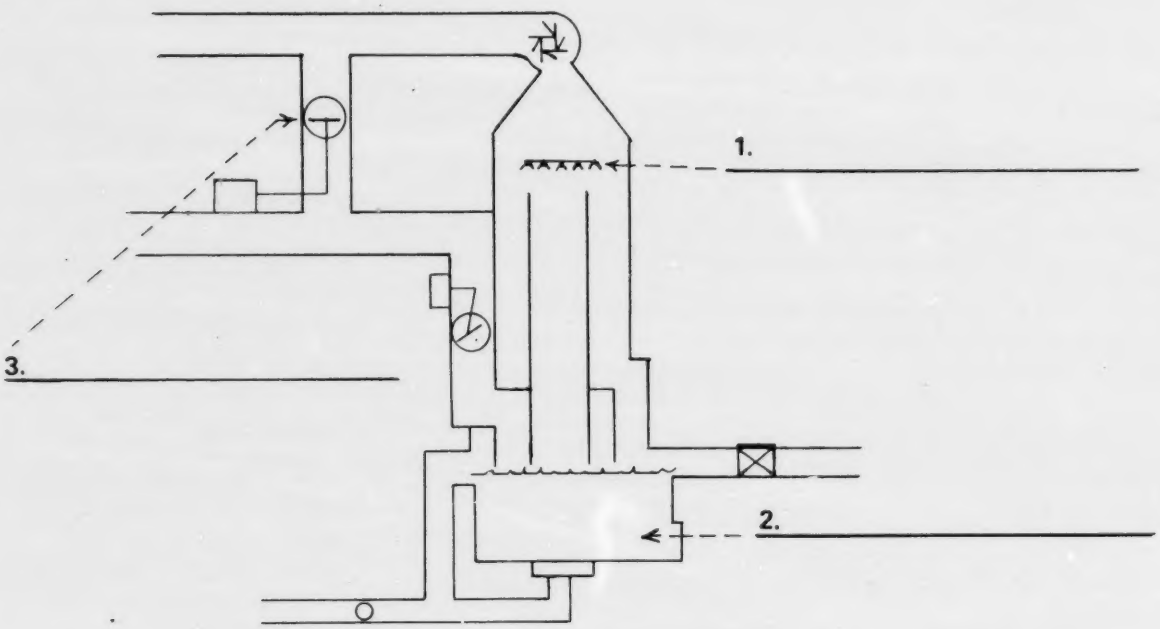
2. What may need to be done to the by-pass damper? _____

– Check your answers.

1. By-pass damper
2. Cleaned and lubricated

SCRUBBER MAINTENANCE TASKS

On the diagram, LABEL THREE SCRUBBER MAINTENANCE TASKS just considered.



– Check your answers.,

1. Clean spray nozzles
2. Clean settling tank
3. Clean/lubricate by-pass damper

PERIODIC MAINTENANCE CHECKS FOR THE INCINERATOR/SCRUBBER ARE SUMMARIZED BELOW:

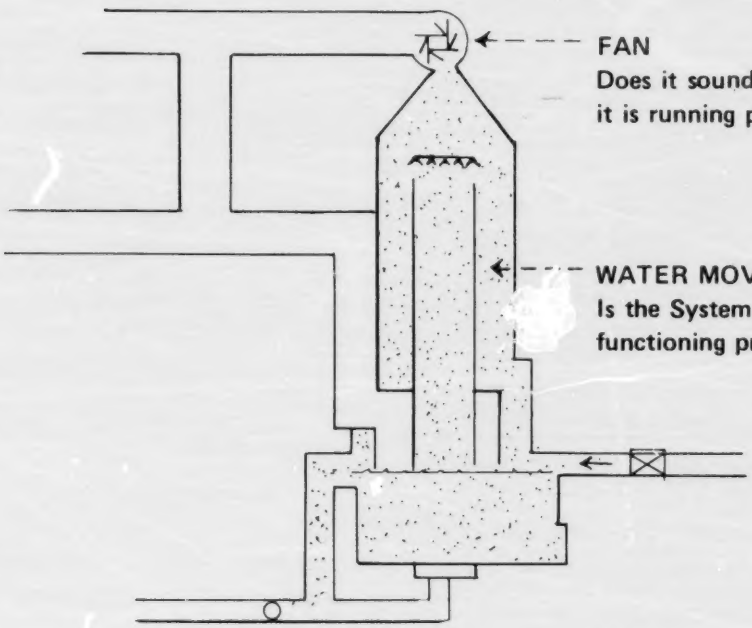
1. Clean Ash Build-Up from Walls
2. Purge Charging Flue
3. Clean Spark Arrestor
4. Clean Spray Nozzles - Scrubber
5. Clean Settling Tank - Scrubber
6. Clean/Lubricate By-Pass Damper

These maintenance tasks are listed on page 9 of the Incinerator Handbook for your future reference.

TROUBLESHOOTING

Even a well-run incinerator produces smoke or odors at times. If this happens, check fou
things which may help you solve the problem. If not, call service.

FIRST - CHECK THE SCRUBBER



If waste gases aren't being pulled from the scrubber, the by-pass damper will automatica
open and that means smoke. The gases cannot be cleaned if the water isn't vigorousiy cleani
them.

1. If you get smoke, what do you check to see if the gases are being cleaned properly?

_____

2. What two things can you check in the scrubber for proper operation?

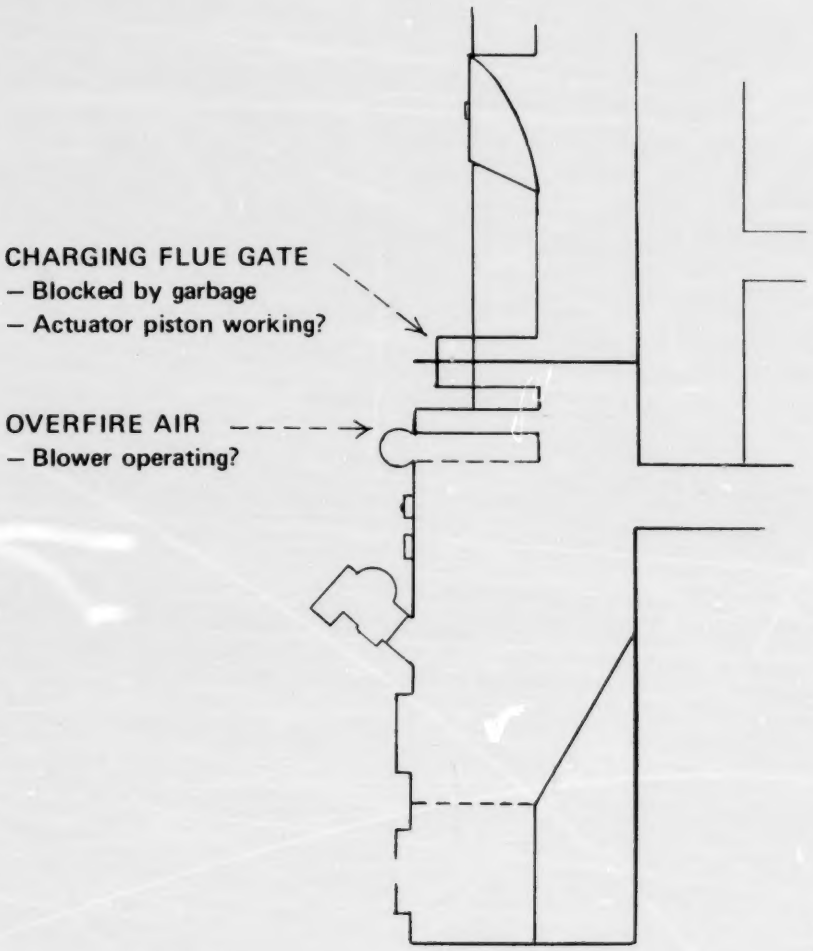
_____

_____

– Check your answers.

1. Scrubber
2. Fan
   Water

If the Scrubber is OK, check the OVERFIRE AIR and the CHARGING FLUE GATE.



The sound of the BLOWER generally tells you if it is operating properly. If the CHARGING FLUE GATE is stuck, you may be able to remedy the situation without calling service.

1. What could be stuck in an open or closed position which may cause smoke?

_____

2. Which major air supply can cause smoke if the blower is not working properly?

_____

3. What are three troubleshooting checks to make in the incinerator should you get smoke?

_____

_____

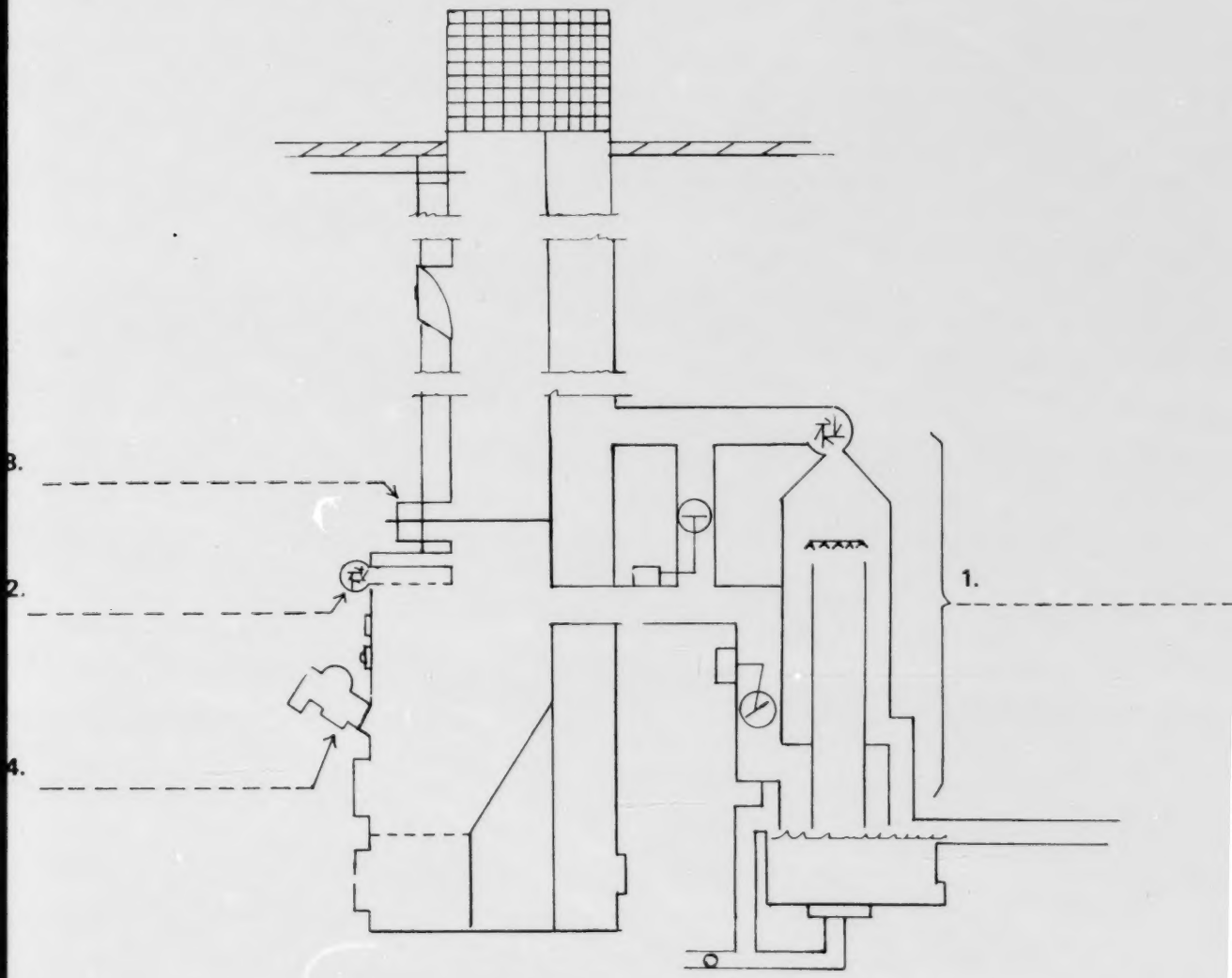
_____

– Check your answers.

1. Charging flue gate
2. Overfire air
3. Scrubber
   Charging flue gate
   Overfire air

The last troubleshooting check before calling service – THE GAS BURNER. If the burner is not running properly, smoke will probably result. A problem here generally means calling service. You should check it out, however, as part of your information when calling service.

On the diagram below, LABEL THE FOUR TROUBLESHOOTING CHECKS to make before calling service when you get incinerator smoke.



– Check these with the list on the following page.

INCINERATOR TROUBLESHOOTING CHECKS before calling service:

1. Scrubber
2. Overfire Air (Blower)
3. Charging Flue Gate
4. Gas Burner

These are included on page 9 of the Incinerator Handbook for your future reference.

INCINERATOR SUMMARY

DAILY CLEANING TASKS

1. Grate
2. Ash Pit
3. Separation Chambers
4. Scrubber Sump
5. Scrubber Water Line Strainer

DAILY CHECKING TASKS

1. Cycling Time Clock
2. Charging Flue Gate
3. Overfire Air - Blower
4. Gas Burner
5. Scrubber - Water Circulation
6. Scrubber - Fan and Motor

PERIODIC MAINTENANCE

1. Clean Ash Build-up (all inside surfaces)
2. Purge Double Flue Incinerators - Charging Flue
3. Clean Spark Arrestor
4. Scrubber - Clean Spray Nozzles
5. Scrubber - Clean Settling Tank
6. Scrubber - Clean/Lubricate By-Pass Damper

TROUBLESHOOTING PROCEDURE

1. Scrubber
2. Overfire Air
3. Charging Flue Gate
4. Gas Burner

REVIEW QUESTIONS: PART VI - INCINERATOR II

1. Where will most of the ash collect from which it must be cleaned each day? _____

2. How often should the grate of the incinerator be cleaned? _____

3. From what two places in the scrubber should you clean residue each day? _____

   _____

4. What is the minimum length of time you should wait after a burn to clean the incinerator? _____

5. What device should be checked daily to be sure all burning ingredients are brought together properly and on time? _____

6. What may become jammed which would result in incomplete garbage drop or firing chamber not being closed off? _____

7. Which air supply is most susceptible to problems and should be checked each day? _____

8. Should the gas burner be checked daily or only periodically? _____

9. What scrubber part should be checked each day to insure proper flue gas removal? _____

10. The action of what basic scrubber supply should be checked daily? _____

11. If separation chamber floors are cleaned each day, ash build-up maintenance tasks will not be necessary. (TRUE or FALSE) _____

12. In a double flue incinerator, what must be done periodically to the charging flue? _____

13. What device at the top of the stack must be cleaned periodically? _____

14. What scrubber part should you clean periodically to be sure you get a good water curtain? _____

15. The scrubber settling tank should be cleaned DAILY, PERIODICALLY, YEARLY. (CHOOSE ONE) _____

16. What should be periodically done to the by-pass damper? _____

17. If you get smoke, what gas cleaning device should you first check? _____

18. What Overfire Air device should be checked in the event of smoke? _____

19. When troubleshooting smoke in the incinerator, should you check the Charging Flue Gate, Gas Burner, or both? _____ _____

ANSWERS TO REVIEW QUESTIONS:

1. ash pit
2. every day
3. sump
   strainer
4. 1 hour
5. cycling time clock
6. overfire air
8. daily
9. fan
10. water
11. False
12. purge it
13. spark arrestor
14. water nozzles
15. periodically
16. cleaned and lubricated
17. scrubber
18. blower
19. both